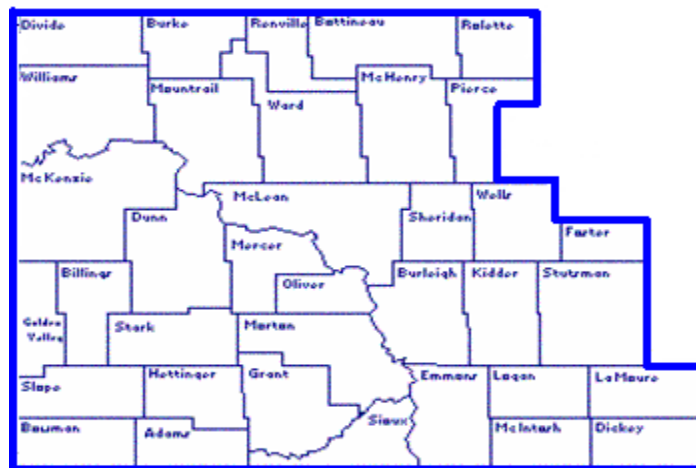


Fall  
2010

# *Dakota Skies*

## **Bismarck North Dakota National Weather Service**

A map of the Bismarck CWA (County Warning Area) or area of responsibility. We issue weather products such as warnings and forecasts for 36 counties in western and central North Dakota. The office has 23 employees of which 14 are meteorologists. We are also staffed with a hydrologist. Staffing is 24 hours a day, seven days a week, year round, serving you.



NOAA's NWS Bismarck web site at...  
**[www.weather.gov/bis](http://www.weather.gov/bis)**

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- 

**For Winter Weather...  
Preparation is key...do it now!**

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### **Winter Weather Awareness Week is October 25-29**

“Severe Winter Weather Awareness Week” in North Dakota is October 25 through October 29. You should...Get a Kit...Make a Plan...and Be Informed. Keep a high level of situational awareness by listening to the forecast every day. When snow, sleet, or freezing rain is in the forecast expect that it will impact your day to day routine, and be ready when it does!

Now is a good time to re-familiarize yourself with winter terms and safety rules. Prepare now for winter! (See page 3.)

## **About this Publication**

*Dakota Skies* is published twice each year, in the spring and in the fall, by the WCM (Warning Coordination Meteorologist) at your National Weather Service in Bismarck, North Dakota. Its purpose is to heighten awareness about safety for the coming severe weather season, whether it be summer or winter, and to relay information on any changes at the Bismarck NWS (National Weather Service). Additionally, other educational and useful information will be provided as space allows. If you have any comments or suggestions contact us.

John Paul Martin, WCM  
NOAA-NWS  
2301 University Dr Building 27  
Bismarck, ND 58504  
701-250-4495

**web site... [www.weather.gov/bis](http://www.weather.gov/bis)**

MIC-Meteorologist-In-Charge  
Jeff Savadel ([Jeffrey.savadel@noaa.gov](mailto:Jeffrey.savadel@noaa.gov))  
WCM-Warning Coordination Meteorologist  
John Paul Martin ([john.paul.martin@noaa.gov](mailto:john.paul.martin@noaa.gov))  
SOO-Science Operations Officer  
Joshua Scheck ([Joshua.Scheck@noaa.gov](mailto:Joshua.Scheck@noaa.gov))  
ESA-Electronics Systems Analyst  
Karl Venneberg ([karl.venneberg@noaa.gov](mailto:karl.venneberg@noaa.gov))  
OPL-Observation Program Leader  
Len Peterson ([leonard.peterson@noaa.gov](mailto:leonard.peterson@noaa.gov))  
SH-Service Hydrologist  
Allen.Schlag@noaa.gov

Inquires at 701-223-4582  
Weather and a forecast at 701-223-3700

### **NWS Williston Contacts**

NOAA-NWS  
402 Airport Rd  
Williston, ND 58801-9802  
Inquires at 701-572-3198  
Forecast at 701-572-2351

OIC-Official-In-Charge  
Rick Krolak ([richard.krolak@noaa.gov](mailto:richard.krolak@noaa.gov))

## Winter Weather Terminology

Watch is issued when the risk of a hazardous winter weather event has increased, but its occurrence, location, and/or timing is still uncertain.

Warning or Advisory is issued when a hazardous winter weather event is occurring, is imminent, or has a high probability of occurrence. A warning is used when there is a threat to life or property. An advisory is for less serious conditions that cause inconvenience, and, if caution is not used, could lead to situations that may threaten life or property.

Snow criteria for a warning is 6 inches or more in 12 hours or less, OR, 8 inches or more in 24 hours or less. Snow criteria for an advisory is 3 to 5 inches.

Winter Storm Warnings and Winter Weather Advisories may be issued for a combination of elements like snow coupled with wind and blowing snow, or snow coupled with sleet and freezing rain.

Sleet is pellets of ice. Sleet bounces when it hits the ground.

Freezing Rain is rain that freezes when it hits the ground or objects on the ground. It forms a sheet or glaze of ice.

Ice Storm is used to describe occasions when the ice from freezing rain is significant enough (1/4 inch thick or more) to cause damage.

Blizzard is a storm with winds of 35 mph or higher AND visibility frequently below 1/4 mile in snow and/or blowing snow AND these conditions last three (3) hours or longer. There is no set temperature requirement for a blizzard.

Wind Chill is that part of the cooling of a human body caused by moving air. Moving air accelerates the rate of heat transfer away from a human body.

Wind Chill Advisory is issued for wind chills of 25 to 39 below zero with a wind speed of at least 5 mph.

Wind Chill Warning is issued for wind chills of 40 below zero and colder with a wind speed of at least 5 mph.

## wind chill table

wind speed down left side - temperature across top

	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

## Be Prepared

In the cold dress in layers of loose fitting clothes. Wear a hat, gloves or mittens, and a scarf. Have as little skin as possible exposed to the elements.

When shoveling snow go slow, take breaks, and don't get too tired. Keep fire hydrants near your home or business visible and free of snow.

Carry a winter survival kit in your vehicle. Include extra clothing, a blanket, and high energy food like candy bars, peanuts, and raisins. Have a flash light with fresh batteries, paper towels, sand, and a shovel. Keep the gas tank and windshield washer bottle full.

Before you set out on a trip let someone know the time you leave, the route you will take, and the time you plan to arrive. Check the latest forecast and road report. Take a cell phone and be sure the vehicle windows, headlights and taillights are clear of snow, ice, and frost.

If you get stuck, raise the vehicle antenna and tie a brightly colored cloth to it so that others passing by will see you. Keep the exhaust pipe clear of snow but do not overexert yourself by trying to push or shovel the vehicle out of deep snow. Keep a window open about a half inch. Clap your hands and rub your legs. Move your body around in the vehicle. Stay inside the vehicle. Do not try to walk away from the vehicle unless you can see a place of safety at a close distance. Do not fall asleep! Stay awake!

## Winter 2010-2011 Outlook

[www.cpc.ncep.noaa.gov](http://www.cpc.ncep.noaa.gov)

The 2010-2011 winter outlook from your National Weather Service in Bismarck calls for an enhanced chance of below average temperatures and above average precipitation for west and central North Dakota.

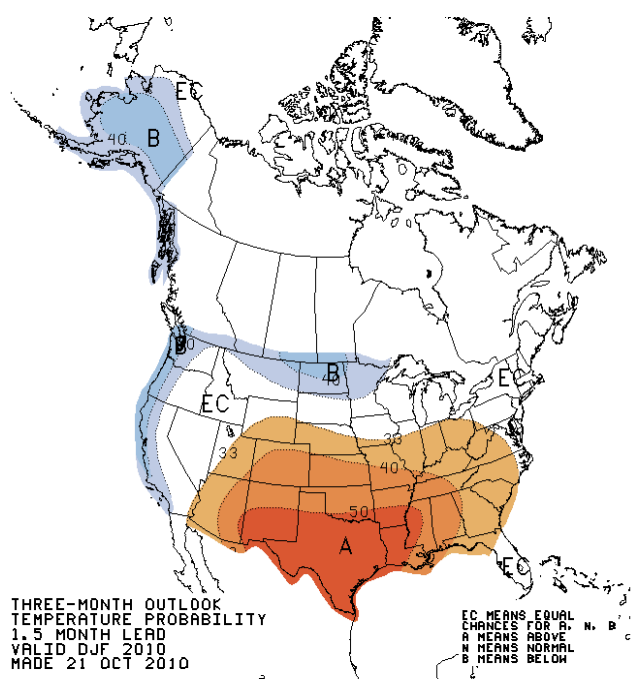
This forecast is an average over the three month period called Meteorological Winter, namely December, January, and February. As always we need to be mindful that March and April can bring big storms through the state. Also, remember that although this long term forecast is firmly based on the science of meteorology, along with climatology factored in, as with any forecast it is subject to change.

Through the winter over western and central North Dakota average maximum (high) temperatures are in the 20s, and average minimum (low) temperatures are close to zero. Snowfall during this period averages around 25 inches. These numbers are for December through February only. If we take the entire “snow” season, which usually starts in mid October and runs through April, average snowfall is around 50 inches.

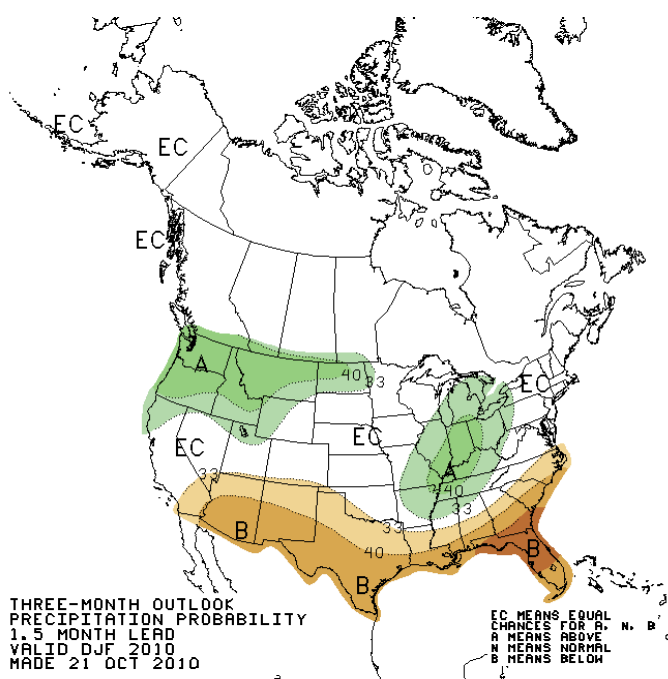
This forecast is based, in part, on the expectation that La Nina, the low phase of the El Nino Southern Oscillation (ENSO), occurring this fall will continue through the winter. Another factor is the PDO (Pacific Decadal Oscillation), and, with it being in its negative phases, is expected to enhance the effects of La Nina. La Nina is characterized by cooler than normal eastern Pacific Ocean sea surface temperatures. These cooler than normal ocean temperatures affect the atmospheric pressure over the Pacific, which in turn alters the location of the jet stream, that river of air that steers storms. It is expected that the Polar Jet will run from Alaska, toward the southeast over western Canada, and into the Northern Plains. This should allow more frequent outbreaks of colder air into North Dakota. Also, historically in this pattern, the spring to follow, namely March, April, and May, are generally cooler and wetter than normal, overall.

Finally, it is always important to keep in mind that these forecasts are meant to represent the whole winter season, not a day to day forecast. Tremendous day to day variability exists throughout the winter. As we all know, it would not be winter in North Dakota without a few big storms and some bitterly cold arctic outbreaks. There will be snowy days and cold days, just like every winter in North Dakota, and this time around those cold outbreaks could be more frequent and last longer.

### Temperature Outlook Dec-Jan-Feb



### Precipitation Outlook Dec-Jan-Feb



## Valuable Web Sites

NWS Bismarck at  
[www.weather.gov/bis](http://www.weather.gov/bis)

NWS Grand Forks at  
[www.weather.gov/fgf](http://www.weather.gov/fgf)

North Dakota Department of Emergency Services at  
[www.nd.gov/des](http://www.nd.gov/des)

North Dakota Department of Transportation at  
[www.dot.nd.gov](http://www.dot.nd.gov)

North Dakota Highway Patrol at  
[www.nd.gov/ndhp](http://www.nd.gov/ndhp)

North Dakota Game and Fish at  
[www.gf.nd.gov](http://www.gf.nd.gov)

North Dakota Parks & Recreation Department at  
[www.parkrec.nd.gov](http://www.parkrec.nd.gov)

North Dakota State Fire Marshal at  
[www.ag.state.nd.us/FM/FM.htm](http://www.ag.state.nd.us/FM/FM.htm)

Citizen Corps at  
[www.citizencorps.gov](http://www.citizencorps.gov)

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### Don't Be Late...or Early

Sunday, November 7, 2010...2 AM CDT becomes 1 AM CST. Fall BACK one hour.

Sunday, March 13, 2011...2 AM CST becomes 3 AM CDT. Spring AHEAD one hour.

The Energy Act of 2005 changed the time change dates for DST (Daylight Savings Time) in the United States. DST begins on the second Sunday of March and ends on the first Sunday of November.

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## Road Reports and other DOT information...dial **511**

<b>Winter Officially Begins at 5:38 PM CST on December 21, 2010</b>	<b>Spring Officially Begins at 6:21 PM CDT on March 20, 2011</b>
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### Tornado Statistics (for 2010 data is preliminary)

2010 tornadoes in the Bismarck NWS area or responsibility (west-central ND)...22

2010 tornadoes in the Grand Forks NWS area of responsibility (eastern ND)...32

**2010 total ND tornadoes...54** (second highest number in a year since 1950)

Note that there have only been three years since 1950 with 50 or more tornadoes.

1999 had 61 tornadoes (1st)

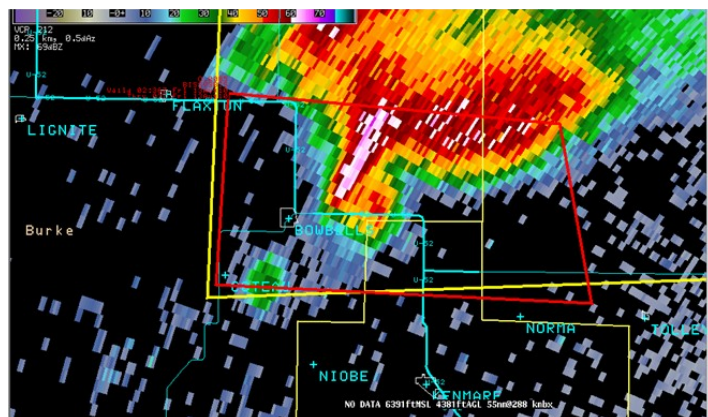
2010 had 54 tornadoes (2nd)

1976 had 52 tornadoes (3rd)

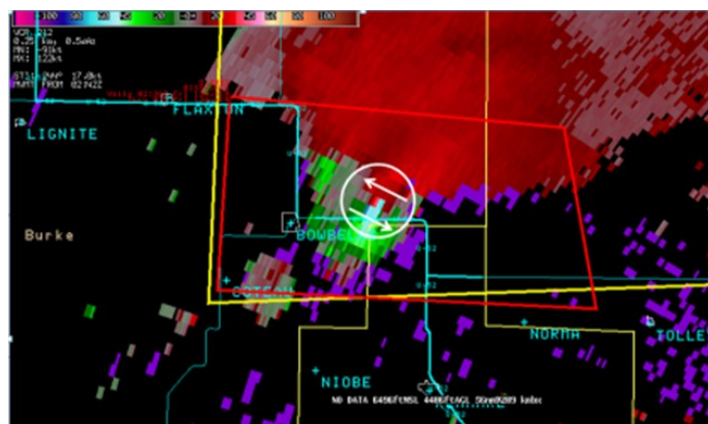


# Summer 2010 High Impact Events

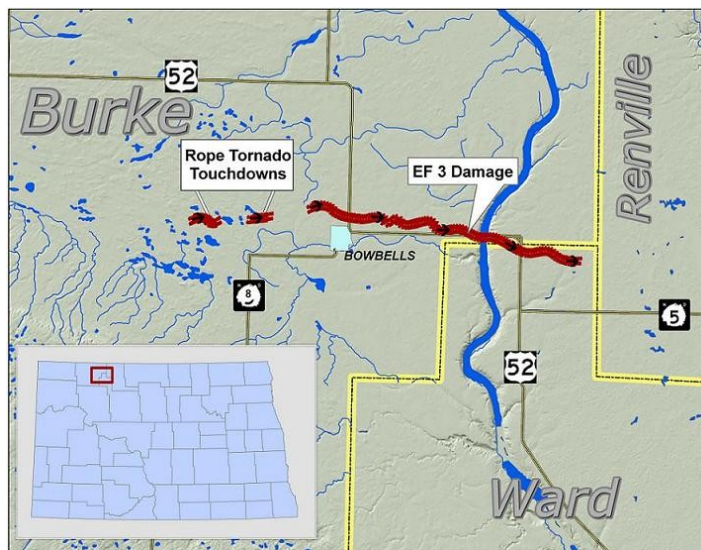
## Bowbells Tornado August 12



Shown above is the 942 pm CDT radar reflectivity image from the Minor Air Force Base WSR-88D radar. Note the hook like shape in the reflectivity just northeast of Bowbells, indicative of low level rotation within a supercell thunderstorm.



Shown above is the 942 pm CDT image of storm relative motion within the supercell just northeast of Bowbells from the Minot Air Force Base WSR-88D radar. Doppler radar can only sense motion directly toward or away from itself. The bright green and blue coloring indicate motion toward the radar within the storm, and bright red coloring, motion away from the radar. The couplet of the bright green and red coloring next to each other over a short distance indicates strong rotation and a possible tornado. This is depicted by the arrow oriented to the southeast toward the radar in the above image, and the arrow pointed toward the northwest, away from the radar.



A total of three tornadoes touched down across far eastern Burke County and into the extreme northern parts of the goose-neck of Ward County on the evening of August 12th, 2010, near the town of Bowbells, North Dakota. The first two tornadoes were reported to be weak, rope tornadoes, 5 miles west of Bowbells and again near the airport on the northwest side of Bowbells at 900 pm and 903 pm CDT respectively. No damage was associated with these first two tornadoes. The third tornado caused one fatality and produced significant damage from near the intersection of Burke County Road 19 and US Highway 52, extending east southeast of Bowbells to where US Highway 52 turns south into Ward County. This tornado was on the ground from about 926 pm CDT to 955 pm CDT, and was estimated to be 400 yards across at its widest.

Tornado warning lead times for the rope tornado touchdowns were one minute and four minutes respectively, with 28 minutes of lead time for the deadly third tornado.

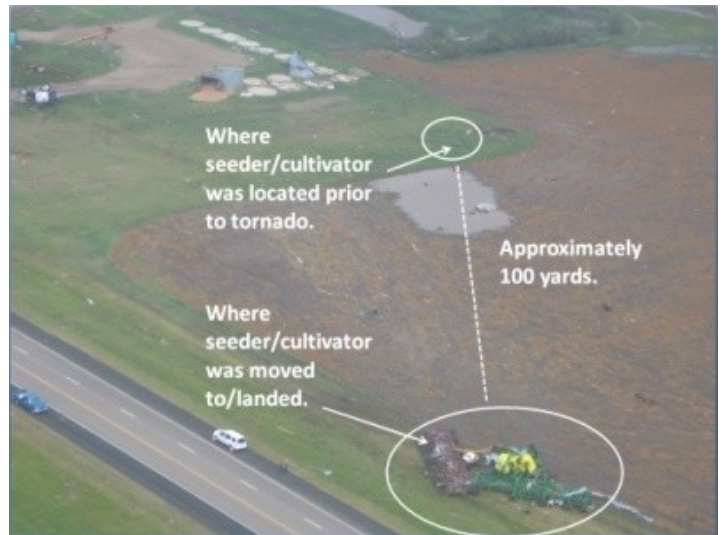
More details and images on page 7.

# Summer 2010 High Impact Events

## Bowbells Tornado Continued



The National Weather Service dispatched a team of meteorologists to investigate the damage and the fatality site to determine a rating of the tornadoes on the Enhanced Fujita (EF) Scale. On one farmstead, 19 out of 21 grain bins were completely destroyed, with the remaining two severely damaged. Furthermore, four of the six outbuildings were completely destroyed with the remaining two severely damaged. Significant damage was also sustained to the farm house, with the roof, upper level of the house, and one exterior wall completely collapsed or removed.



A 50 foot air seeder with an estimated weight of 35,000 pounds connected to a cultivator estimated at 15,000 pounds and a cart estimated at 7,000 to 10,000 pounds, for a combined weight of 57,000 to 60,000 pounds, was moved approximately 100 yards, likely through the air by the tornado. No deep scaring was evident in the soil between the initial location of the farm equipment and its landing place (photo above), supporting the theory that the equipment was tossed through the air. The National Weather Service found the damage consistent with a high end EF3 tornado. From that it was determined that wind speeds were about 165 mph.



Spotters and law enforcement played a key role during the Bowbells tornado. They relayed real time reports of the size and location of the tornado, and damage, to the National Weather Service in Bismarck.



# Summer 2010 High Impact Events

**July 13th-14th**

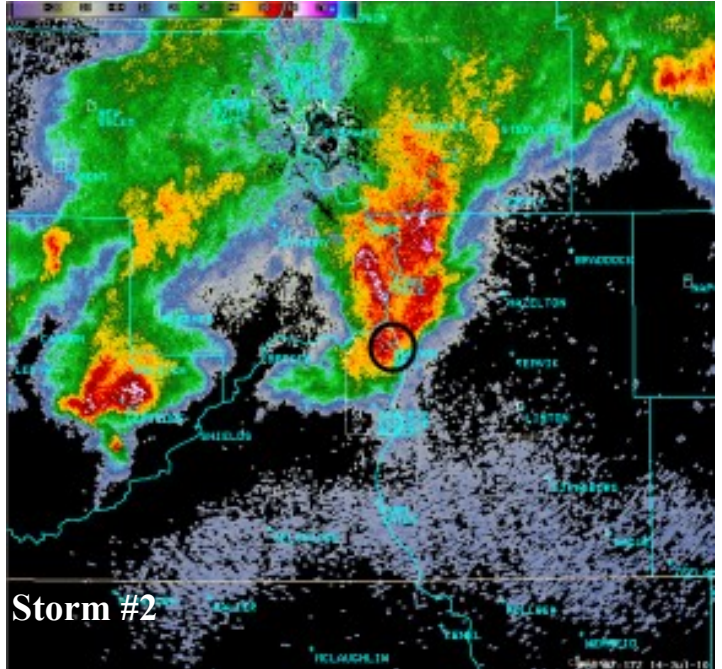
## **The Night of Softball Hail**

A line of intense severe storms developed across southwest ND the evening of July 13th, moving east into the James River Valley through the early morning hours of July 14th. Multiple rounds of large hail resulted across southern North Dakota, including a stone that tied the state record for the largest diameter hailstone, falling at Prairie Knights Resort.

### **Cannon Ball, ND**



Cannon Ball during the early morning of July 14. The first storm dropped softball size hail at 104 am CDT. A little over an hour later softball size hail fell again, at 221 am CDT.

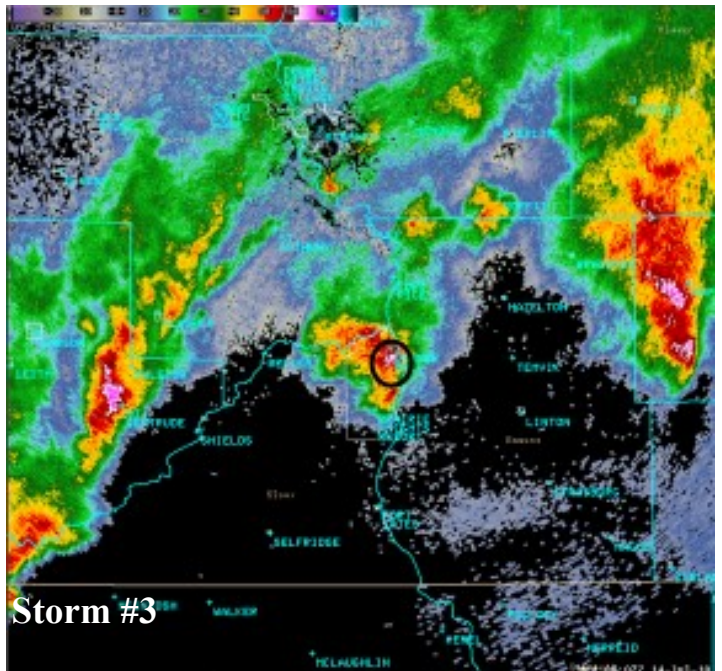


**Storm #2**

Finally, at 310 am, golf ball size hail fell on Cannon Ball. The largest stones broke through the roofs of homes, smashed windows, and completely destroyed automobiles. Crops were pounded and large divots were evident in the ground.



**Storm #1**



**Storm #3**

Three intense storms impacted the small town of



# Summer 2010 High Impact Events

## Prairie Knights Casino

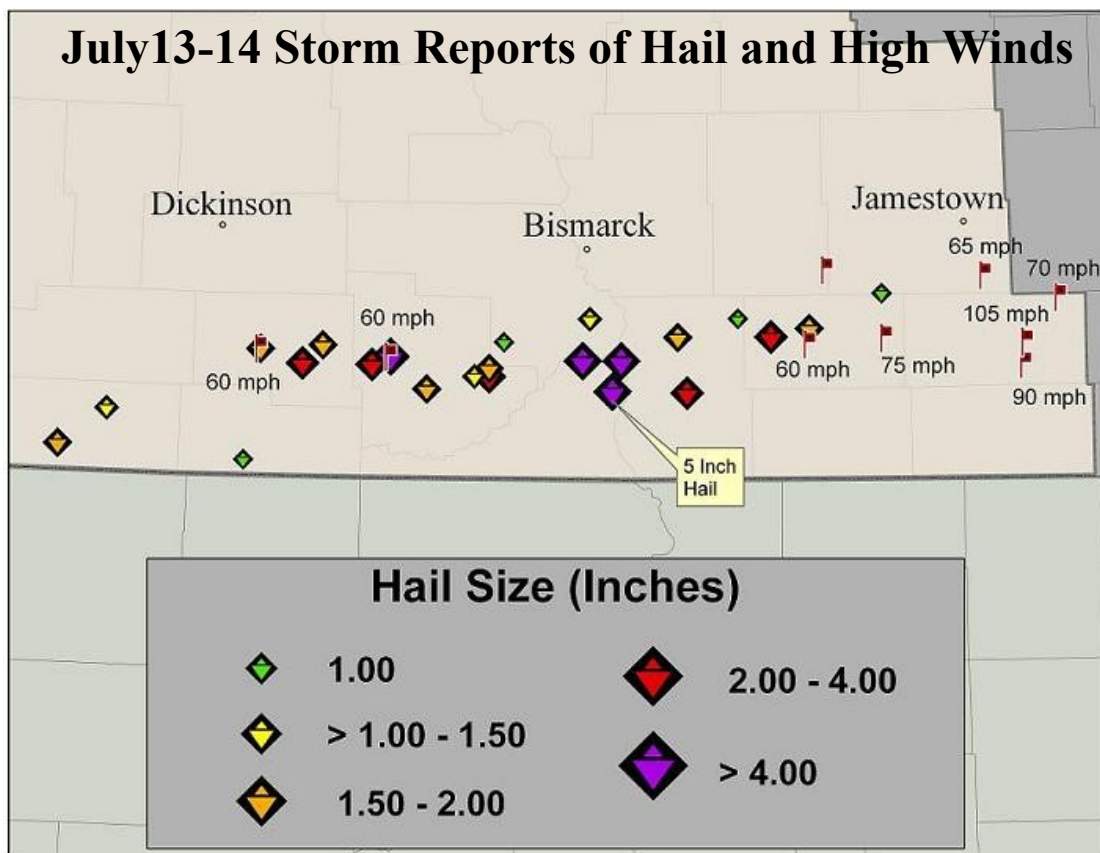


A hailstone measured to be 5 inches in diameter fell at the Prairie Knights Resort on Standing Rock, Sioux County, during the early morning hours of July 14th. This tied the North Dakota state record for the largest diameter hailstone, set on August 3rd, 1969, in Mercer County. The event transitioned from extremely large hail to extremely damaging wind (see map).



Shown above is a destroyed car windshield, taken at the Prairie Knights Resort. A person seated in the front seat of the vehicle was injured as the stone crashed through the windshield and landed in his lap. It is important to seek appropriate shelter away from windows during a severe thunderstorm.

Below is a map of hail and wind reports.



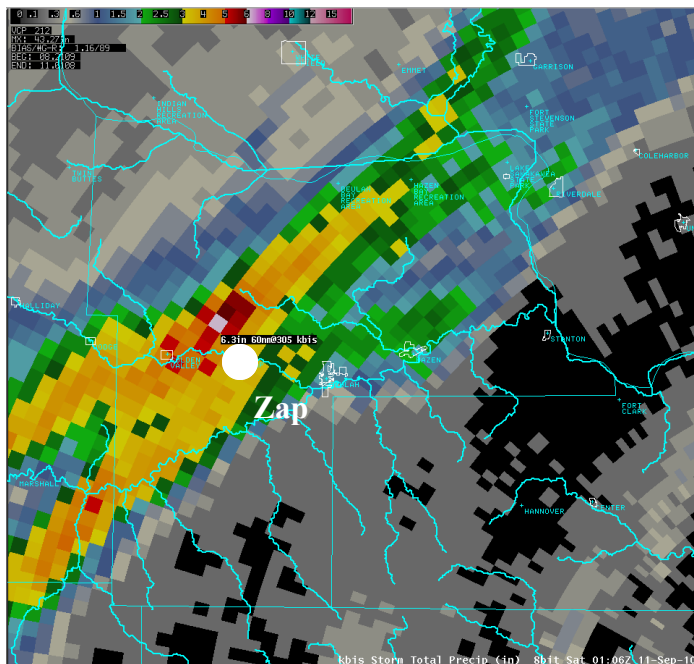
# Summer 2010 High Impact Events

## Minot Flash Flood June 17

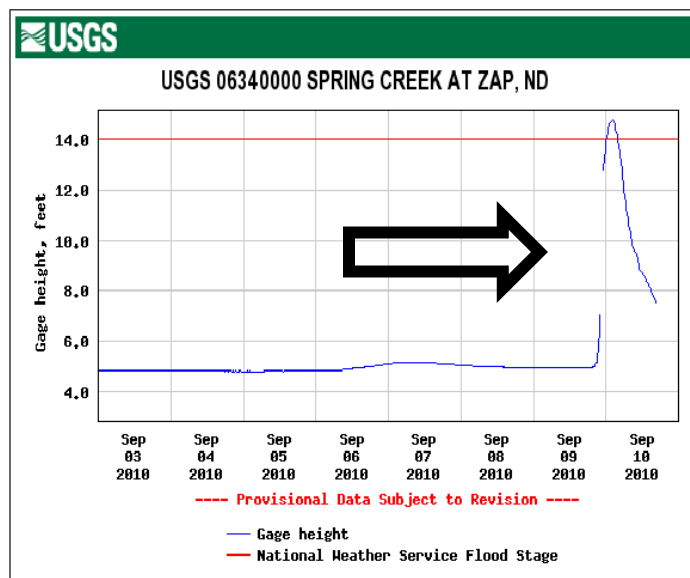
A complex of thunderstorms stalled over the Minot area on June 17th, 2010, with 4.75 inches of rain reported 4 miles northwest of Surrey and 3.62 inches at the Minot Airport. Runoff led to widespread street and overland flooding in the Minot through Velva areas.



## Zap Flash Flood September 9



Two strong thunderstorms affected the Zap area the evening of September 9th, 2010. Shown above is the radar estimated rainfall from the event. The yellow shading is a radar estimate of around 3 inches of rain, with the red shading indicating rainfall amounts approaching 5 inches. A report of 4.75 inches of rain was received 6 miles northwest of Zap, with runoff causing Spring Creek to rise nearly 10 feet and crest at 0.75 ft above flood stage at Zap during the early morning hours of September 10.





# Summer 2010 High Impact Events

## A Record Number of Warnings Issued

The summer of 2010 saw the National Weather Service in Bismarck issue a record breaking number of warnings when you combine Tornado, Severe Thunderstorm, and Flash Flood.

2010 Severe Thunderstorm Warnings...430 individual warnings covering parts of 1,067 counties.

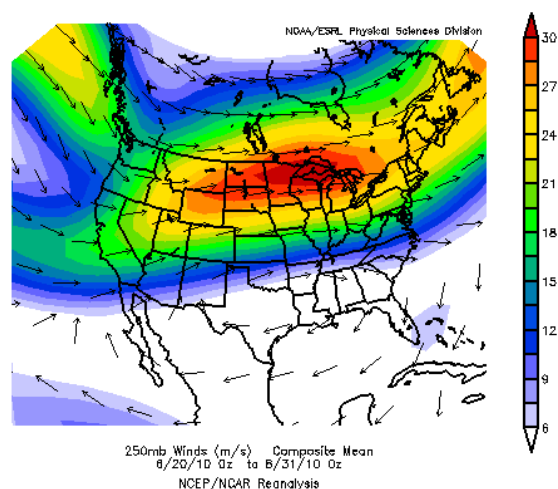
2010 Tornado Warnings...93 individual warnings covering parts of 196 counties.

2010 Flash Flood Warnings...29 individual warnings covering parts of 78 counties.

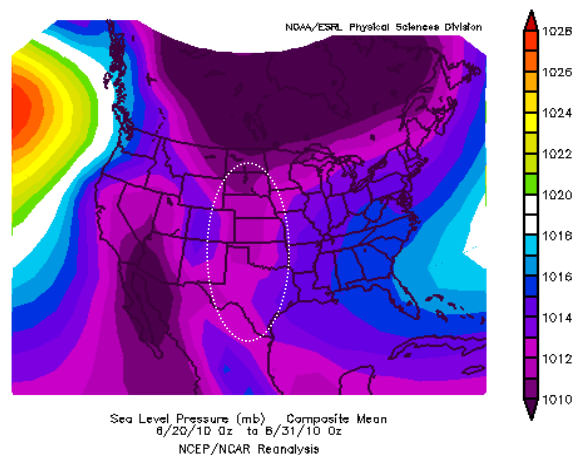
A total of 552 warnings covered parts of 1,341 counties. Before 2010 the most had been 1,102 counties in 2008.

### So why so much severe weather?

During the summer of 2010, the central and eastern Pacific transitioned from El Nino (above normal sea surface temperatures) to the development of La Nina conditions (cooler than normal sea surface temperatures). Such a shift in ocean temperature has an effect on large scale atmospheric circulations across the Northern Hemisphere. During such a transition from El Nino to La Nina conditions, the upper level jet stream resides farther north across the Northern Plains than its usual position. Lower than normal surface pressures also exist across the central United States, drawing Gulf of Mexico moisture all the way north into the Upper Midwest. This combination of a more northern storm track and increased moisture levels set the stage for increased severe weather across the Northern Plains. Shown on the next page is the average jet stream position and average sea level pressure respectively from June 20th –August 31st, 2010.



Note the red and orange coloring in the above image across the Upper Midwest and Northern Plains, representing the axis of the jet stream through much of the summer. As one would expect during the summer when El Nino transitions to La Nina, the jet stream is shifted farther north than its normal position. This leads to increased storminess across the Northern Plains and Upper Midwest.



Shown above are the average summer sea level pressures across the United States. Highlighted by the white circle, note the pink and deep purple coloring across the Northern Plains, representing low pressure. Areas of low pressure act as a forcing mechanism for storms, in addition to their ability to draw increased atmospheric moisture into an area, the fuel needed for storms.





### **SKYWARN Recognition Day 2010**

SRD (SKYWARN Recognition Day) for 2010 has been set for December 4. It will run from 0000 UTC (Universal Coordinated Time) to 2400 UTC. That corresponds to 6 PM CST on December 3, to 6 PM CST on December 4. This will be the 12th annual SRD.

SKYWARN is a national network of severe weather spotters. It is basically volunteers, who are trained in severe weather observing, and report information to the National Weather Service. In this way the spotters become a critical component of the Warning and Decision making process that goes on at the NWS. SKYWARN really is one neighbor helping another in the protection of life and property.

SKYWARN Recognition Day celebrates the contributions that amateur radio operators make to the National Weather Service severe weather operations, and consequently to the public welfare.

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## **U.S. Department of Commerce**

### **National Oceanic and Atmospheric Administration**

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NOAA-National Weather Service  
2301 University Dr Building 27  
Bismarck ND 58504

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